SIEMENS

SIMOTION D

Motion Control

Answers for industry.

SIMOTION Motion Control System
SIMOTION D – Drive-based

Overview of SIMOTION D

Overview

SIMOTION D Control Units: D410-2, D4x5-2 (4 performance classes)

SIMOTION D is the compact, drive-based version of SIMOTION based on the SINAMICS S120 drives family.

The SIMOTION D Control Units are available in the following variants:

- SIMOTION D410-2 are compact Control Units for single-axis applications with multi-axis option. The Control Units are available in variants D410-2 DP and D410-2 DP/PN and are snapped onto the SINAMICS S120 PM340 Power Modules in blocksize format.
- SIMOTION D4x5-2 are Control Units for multi-axis applications in the SINAMICS S120 booksize format and are available in the following performance variants:
  - SIMOTION D425-2 DP and D425-2 DP/PN Control Units (BASIC Performance) for up to 16 axes
  - SIMOTION D435-2 DP and D435-2 DP/PN Control Units (STANDARD Performance) for up to 32 axes
  - SIMOTION D445-2 DP/PN (HIGH Performance) Control Unit for up to 64 axes
  - SIMOTION D455-2 DP/PN Control Unit (ULTRA-HIGH Performance) for up to 128 axes or applications with very short control cycle clocks

This fine scalability ensures a quick response to changing requirements in automation without having to change the system.

Device concept

With SIMOTION D, the PLC and motion control functionalities as well as the SINAMICS S120 drive software run on a shared control hardware. The IEC 61131-3-compliant PLC integrated in SIMOTION D means that the system is not just capable of controlling motion sequences, but that the entire machine can also be controlled with a single compact unit.

Depending on the SIMOTION D platform, HMI devices can be operated on the onboard PROFIBUS, Ethernet or PROFINET interface for operator control and monitoring. Functions such as remote maintenance, diagnostics and teleservice can also be used via these interfaces.

Benefits

- Cost-effective thanks to the integration of PLC, motion control and technology functions direct in the drive
- Employs the innovative SINAMICS S120 design
- Compact form-factor reduces control cabinet size
- Ideally suited to modular and distributed machine concepts
- User-friendly operation
- Variable networking via a wide range of communication interfaces:
  - D410-2 DP, D4x5-2 DP: Industrial Ethernet and PROFIBUS DP onboard
  - D410-2 DP/PN, D4x5-2 DP/PN: Industrial Ethernet, PROFIBUS DP and PROFINET IO onboard
- Powerful thanks to a range of technology functions
- Very simple engineering, from drive commissioning to open-loop control and Motion Control applications
- Easy to service thanks to the CompactFlash card, which can be easily replaced and contains all data (programs, data, drive parameters, and licenses)
- Very dynamic because the interfaces between PLC and Motion Control are no longer required

Application

SIMOTION D can be used optimally wherever

- the SINAMICS S120 drive family is used
- the motion control and PLC functionality are directly executed in the drive (SINAMICS S120)
- compact, space-saving construction is required
- high performance is required for motion control and high-speed I/O
- high electromagnetic compatibility and a high resistance to shock and vibration are required due to harsh ambient conditions
- modular machine concepts with high-speed isochronous coupling is required

The flexible solution for modular machine concepts

SIMOTION D optimally supports the implementation of modular machine concepts in which single-axis drives and high-performance multi-axis drives have to be combined:

- SIMOTION D410-2 (blocksize format) is the most cost-effective solution for the design of compact drives, ranging from single units to small-scale multi-axis solutions with typically 2 to 3 axes.
- SIMOTION D4x5-2 (booksize format) performs the open-loop and closed-loop control functions for multi-axis groups with up to 128 axes.

Important applications include:

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Converting
- Handling devices

Due to the increasing use of servo and vector drives, these machines require a high degree of integration of PLC, motion control and technology functions.

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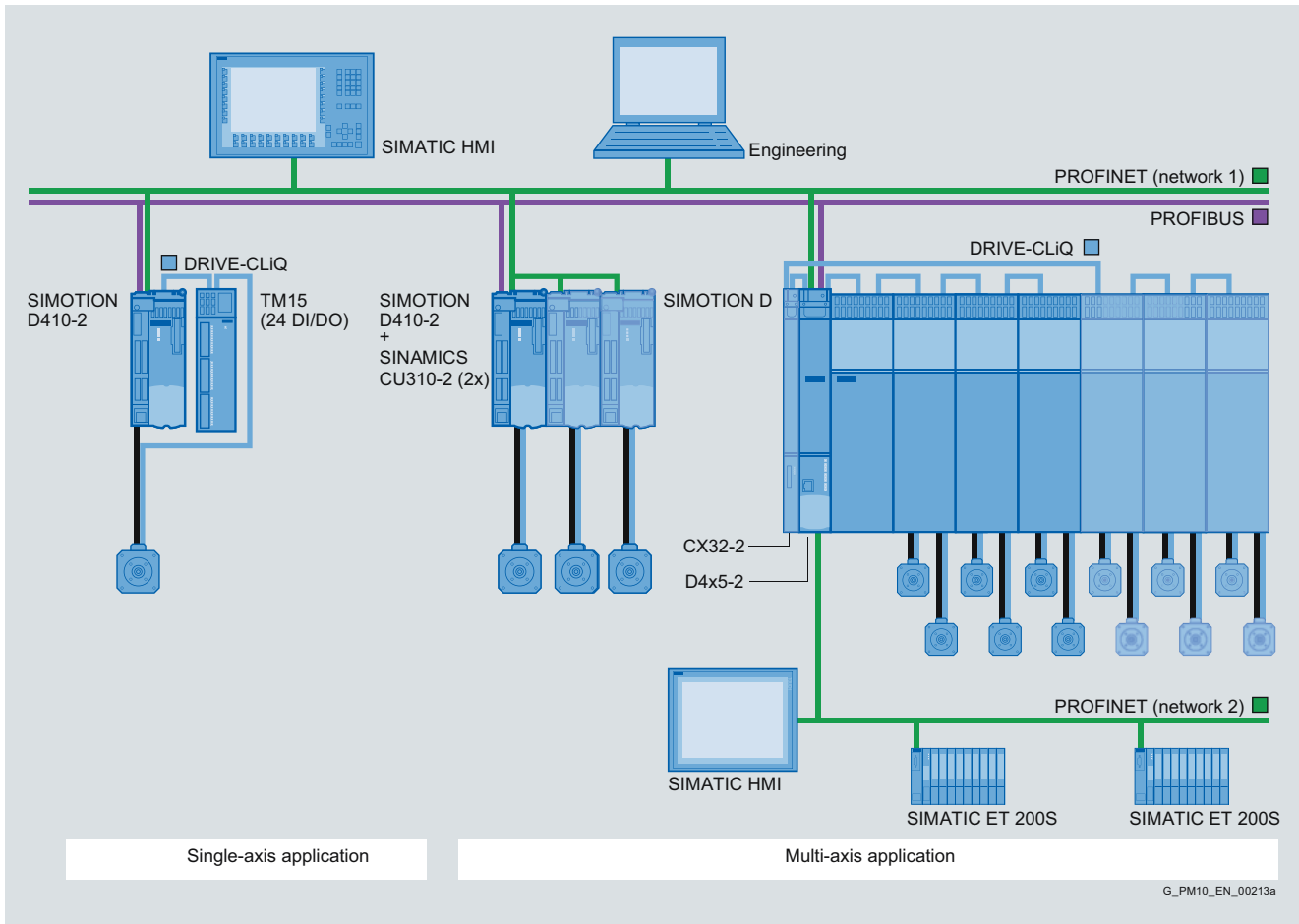
Design

Typical design of an automation solution using SIMOTION D

SIMOTION D components and interfaces

- Various status/error displays
- Onboard digital inputs and outputs
- Option slot (receptacle, only for D4x5-2), e.g. for expansion with additional I/Os with the TB30 Terminal Board
- Integrated communications interfaces for linking:
  - SINAMICS S120 drive modules
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other motion control and automation systems
  - Other SINAMICS S110/S120 drives with digital setpoint interface
- Slot for CompactFlash card for data backup

Construction of a single axis with SIMOTION D410-2

The following components make up a SIMOTION D410-2 single axis system:

- A SIMOTION D410-2 Control Unit, designed for open and closed-loop control of a single drive
- A SINAMICS S120 PM340 Power Module, blocksize format (combined infeed and power module)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.

The connection between SIMOTION D410-2 and the SINAMICS S120 PM340 Power Module is made via the inte-

grated PM-IF interface or, when the CUA31/CUA32 Control Unit Adapter is used, via DRIVE-CLiQ.

Structure of an axis grouping with SIMOTION D410-2

In order to create a multi-axis grouping with SIMOTION D410-2, additional SINAMICS S110/S120 Control Units are connected to the SIMOTION D410-2 by means of PROFIBUS or PROFINET.

Motion control is performed centrally by the SIMOTION D410-2 using the SIMOTION technology objects.

Structure of an axis grouping with SIMOTION D4x5-2

The following components comprise a SIMOTION D4x5-2 axis grouping:

- A SIMOTION D4x5-2 Control Unit, designed for open and closed-loop control of a multiple axis grouping
- A SINAMICS S120 Line Module (infeed module)
- One or more SINAMICS S120 Motor Modules (power modules)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.

The connection between the SIMOTION D Control Unit and the SINAMICS S120 drive modules is made via DRIVE-CLiQ.

Note:

SINAMICS S120 PM340 Power Modules in blocksize format can be operated on a SIMOTION D4x5-2/CX32-2 with the Control Unit Adapters CUA31/CUA32.

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Design (continued)

Expansion using I/O

SIMOTION D can be expanded with the following I/O:
- Distributed I/O systems (e.g. SIMATIC ET 200S)
- Drive-based control cabinet I/O (e.g. TM15, TM31 Terminal Modules, etc.)
- I/Os in booksize compact format (e.g. TMC1080 PN, ...)

Function

Basic functionality

The SIMOTION D basic functionality is supplied with the CompactFlash card (CF) and is loaded when the voltage is switched on. The basic functionality includes:
- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion control functions (Motion Control Basic)
- SINAMICS S120 drive control
  - SIMOTION D410-2:
    Current/speed control (based on CU310-2, firmware version V4.x) for up to 1 servo axis, 1 vector axis or 1 *V/f* axis
  - SIMOTION D4x5-2:
    Current/speed control (based on CU320-2, firmware version V4.x) for up to 6 servo axes, 6 vector axes or 12 *V/f* axes, closed-loop control for infeed (Active Line Module)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

Position-controlled motion control for drives

- Integrated drives (SINAMICS Integrated):
  The power units are connected over DRIVE-CLiQ or over the integrated PM-IF interface optionally for the SIMOTION D410-2.
- Drives with digital setpoint interface:
  SIMOTION D enables position-controlled motion control for drives with digital setpoint interfaces via PROFIBUS DP/PROFINET IO with PROFIdrive.
- Drives with analog setpoint interface, e.g. for retrofit or hydraulic applications:
  The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog ± 10 V setpoint interfaces. The IM 174 also makes it possible to connect stepper drives with a pulse direction interface.
  Both modules are connected over PROFIBUS DP. The following can be connected to one ADI 4 or IM 174 module:
  - 4 drives
  - 4 encoders
  - Digital inputs and outputs

SIMOTION technology packages

A special feature of SIMOTION is that the basic functionality can be expanded by loading technology packages, such as:
- Motion Control with the technology functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation (not D410-2)

- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you will actually use.

Performance

Hardware-supported floating-point arithmetic enables complex arithmetic functions to be used effectively.

Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

Operator control and monitoring (HMI)

Communication services which support user-friendly data exchange with HMI devices are integrated in the basic functionality of SIMOTION D.

Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to SIMOTION D over PROFIBUS, Industrial Ethernet or PROFINET and they are configured using WinCC flexible.

Version V7.0 and higher of the SCADA system WinCC features a SIMOTION channel which is included as standard on the WinCC DVD.

With the SIMATIC NET communications software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION D with an integrated Web server on which, for example, user-specific Web pages can be stored.

Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

Process and data communication

Thanks to its integrated interfaces, SIMOTION D supports both process and data communication.

PROFINET IO with IRT is available for exacting motion control applications. In addition to cycle clock synchronization, cycle times of minimum 250 µs and safety-related communication (PROFIsafe), the PROFINET interfaces on the SIMOTION D4x5-2 Control Units also support media redundancy (MRP/MRPD).

The SIMOTION SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

Function (continued)

Safety Integrated functions

The integrated safety functions of SINAMICS S120 allow SIMOTION D to provide practical, highly-effective protection for personnel and machinery.

The following Safety Integrated functions are currently available for the integrated SINAMICS S120 drive system:
(Terms in accordance with IEC 61800-5-2)

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop1 (SS1)
- Safe Stop2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

Activation of Safety Integrated functions

Safety Integrated functions can be activated by the following methods:

- Via terminals on the D4x5-2/CX32-2 and on the power unit (STO, SBC, SS1 only)
- Via fail-safe inputs on the TM54F Terminal Module
- Via fail-safe outputs on the D410-2
- Via PROFINET/PROFIBUS with PROFIsafe.

The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

Safety Integrated functions via PROFIsafe

Safety Integrated functions are activated via "PROFINET with PROFIsafe" or "PROFIBUS with PROFIsafe" safe communication. The control (F logic) is implemented using an F-CPU connected via PROFINET or PROFIBUS, for example, a SIMATIC S7-300 F-CPU.

Safety Integrated functions are routed through from the SIMOTION D410-2 and D4x5-2 Control Units to the following drives:

- Integrated SINAMICS S120 drives on SIMOTION D410-2 and D4x5-2
- Drives on the SIMOTION CX32-2 Controller Extension
- Drives on SINAMICS Control Units connected via PROFIBUS to SIMOTION D.
- Drives on SINAMICS Control Units connected to SIMOTION D via PROFINET (F-CPU must be connected via PROFINET in this case).

Note

For more information about possible topologies, axis quantity structures and suitable components, please contact your local Siemens sales office.

Detailed information can be found in the SIMOTION D Commissioning Manuals as well as in the SINAMICS documentation.

Safety Integrated solution using a SIMOTION D4x5-2 as an example: Control of the safety functions via PROFINET with PROFIsafe

SIMOTION Motion Control System
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SIMOTION D410-2 Control Units

Overview

Left: SIMOTION D410-2 Control Unit attached to mounting plate
Right: SIMOTION D410-2 Control Unit, snapped onto
PM340 Power Module

SIMOTION D410-2 is the SIMOTION D variant for single-axis applications with multi-axis option in blocksize format. The Control Units form part of the SIMOTION D4x5-2 controller family which is the preferred option for multi-axis applications in book-size format. The SIMOTION D410-2 Control Unit is available in a PROFIBUS variant (D410-2 DP) and in a PROFIBUS/PROFINET variant (D410-2 DP/PN).

The SIMOTION D410-2 Control Units are specially designed for use with the SINAMICS S120 PM340 Power Modules in block-size format and can be directly connected to the Power Modules of this series. The SIMOTION D410-2 can also be installed on a mounting plate if required (to be ordered separately).

SIMOTION D410-2 Control Unit and mounting plate

The SIMOTION D410-2 handles the motion control, technology and PLC functions associated with a single axis and is also responsible for the drive control of that axis. The integrated inputs/outputs support up to 8 high-speed output cams or 8 measuring inputs.

The drive control supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and *V/f* control.

SIMOTION D410-2 can be used in synchronized groups:
- For PROFINET: with controller – controller or controller – device relationship
- For PROFIBUS: with master – slave relationship

Application

SIMOTION D410-2 is the ideal solution when motion control for one axis and PLC functionality are required in compact format. However, it can also be used for small multi-axis groupings with typically 2 to 3 axes in blocksize format. With these applications, the SINAMICS Control Units are connected to the SIMOTION D410-2 via PROFIBUS or PROFINET.

Examples of SIMOTION D410-2 applications include:

- Autonomous control of single axes
- Cross cutters

- Winder applications
- Feeder devices/roller infeed/press feeders
- Synchronized machining equipment
- Compact machine modules, e.g.
  - Feeders in post press applications
  - Shrink wrapping machines.
- Small multi-axis groupings (typically 2 to 3 axes) in blocksize format
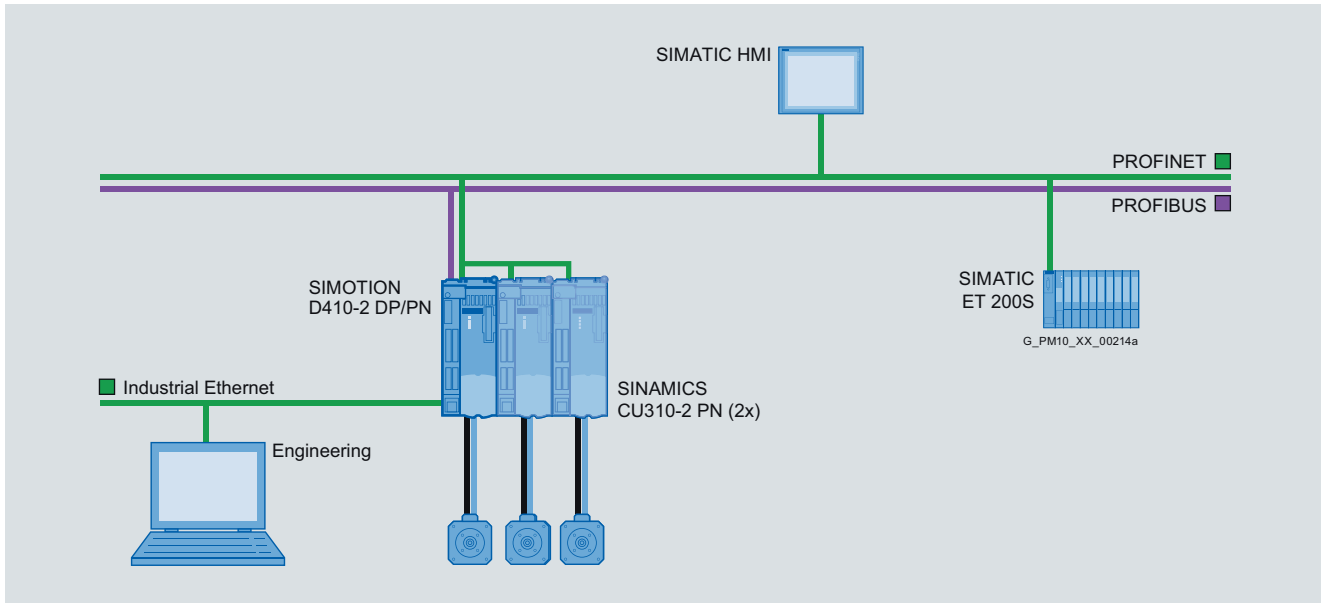
SIMOTION D410-2 axis grouping with 3 axes (1 × D410-2 DP/PN, 2 × CU310-2 PN)

SIMOTION D410-2 supports motion control with the technology functions "positioning" (POS), "synchronous operation/electronic gear" (GEAR) and "cam" (CAM). "Path interpolation" (PATH) is not supported.

SIMOTION Motion Control System
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SIMOTION D410-2 Control Units

Design

Interfaces

Display and diagnostics
- LEDs to display operating states and errors
- 3 measuring sockets
- Service switch and mode selector
- Diagnostics button

Onboard I/Os
- 5 digital inputs
- 8 digital inputs/outputs (max. 8 as output cams or 8 as measuring inputs)
- 3 fail-safe, two-channel inputs (F-DI); can also be used as 6 DI
- 1 fail-safe output (F-DO); can also be used as 1 DO
- 1 analog input (either ± 10 V or ± 20 mA)

Communication
- 1 × DRIVE-CLiQ
- 1 × PROFINET IO
  (1 interface with 2 ports, D410-2 DP/PN only)
- 1 × PROFIBUS DP (D410-2 DP: 2 × PROFIBUS DP)

Data backup
- 1 × slot for SIMOTION CompactFlash card

Additional interfaces
- Terminals for 24 V electronics power supply
- 1 × encoder input for
  - HTL/TTL incremental encoder
  - SSI absolute encoder (without incremental signals)
- 1 × temperature sensor input (KTY84-130 or PTC)
- PM IF interface (Power Module interface) on rear for direct operation with a SINAMICS S120 PM340 Power Module in blocksize format

Assembly/Installation

SIMOTION D410-2 can be directly plugged in to the SINAMICS S120 PM340 Power Module in blocksize format.

Alternatively, the SIMOTION D410-2 can be mounted on a mounting plate (to be ordered separately) and connected to the PM340 Power Module via DRIVE-CLiQ. In this case, the CUA31/CUA32 Control Unit Adapter has to be connected to the PM340 Power Module. No more than one Control Unit Adapter can be connected to the SIMOTION D410-2.

Note:

It is not possible to use the Safety Integrated Extended Functions via the onboard terminals (F-DI, F-DO) when the PM340 Power Module is connected via CUA31/CUA32.

Power Modules in AC/AC chassis format are connected to the SIMOTION D410-2 over the DRIVE-CLiQ interface. Motor Modules in booksize format cannot be connected to SIMOTION D410-2.

A SIMOTION D410-2 mounted on the mounting plate can also be operated without the PM340, e.g.
- for hydraulic applications using a TM31 for the analog inputs and analog outputs
- for the connection of drives with analog ± 10 V setpoint interface (IM 174/ADI 4)

Data storage/data backup

The SIMOTION D410-2 Control Units store the retentive process data permanently in a manner that requires no maintenance (refer to technical data for memory size). The real-time clock is backed up for several days via a SuperCap.

The runtime software, user data and user programs are backed up on the SIMOTION CompactFlash card. The retentive process data of the Control Unit can also be stored on this CompactFlash card via system command, e.g. if spare parts are required.

Connectable I/Os

PROFINET IO: (D410-2 DP/PN only)
- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/SP/M/eco PN/pro and TMC
- HMI

PROFIBUS DP:
- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- HMI

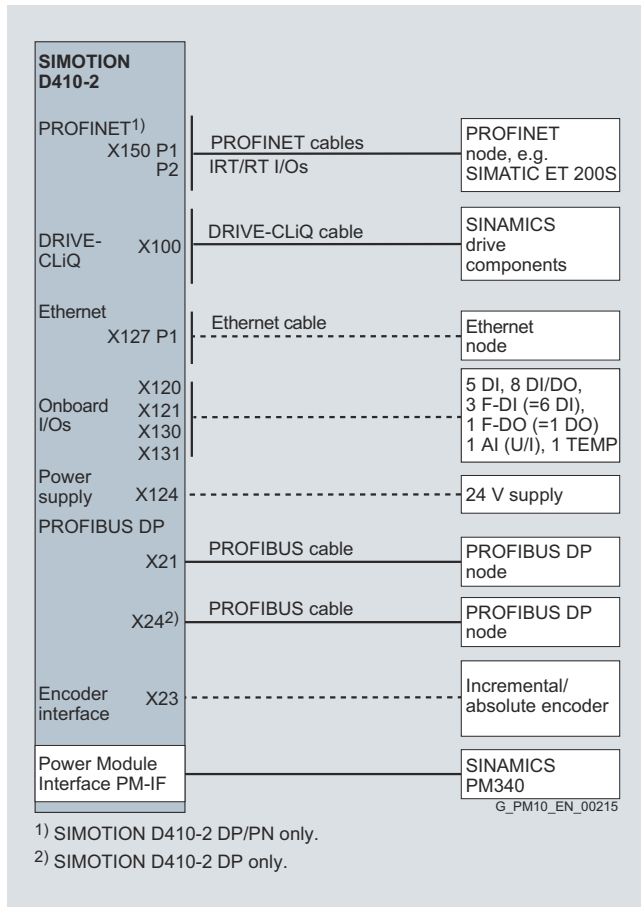DRIVE-CLiQ:

Modules from the SINAMICS range:
- Terminal Modules (max. 8), of which
  - maximum 3 are TM15, TM17 High Feature, TM41
  - maximum 8 are TM15 DI/DO, TM31
  - maximum 1 is TM54F
  - SMC/SME Sensor Modules
    (max. 5 encoder systems via DRIVE-CLiQ)
  - DMC20/DME20 DRIVE-CLiQ Hub Module (max. 1)
  - Motors with DRIVE-CLiQ interface

■ Integration


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SIMOTION
D410-2

PROFINET1)
          X150 P1        PROFINET cables        PROFINET
               P2        IRT/RT I/Os            node, e.g.
                                                SIMATIC ET 200S

DRIVE-        X100        DRIVE-CLiQ cable       SINAMICS
CLiQ                                            drive
                                                components

Ethernet
          X127 P1        Ethernet cable         Ethernet
                                                node

              X120                              5 DI, 8 DI/DO,
Onboard       X121                              3 F-DI (=6 DI),
I/Os          X130                              1 F-DO (=1 DO)
              X131                              1 AI (U/I), 1 TEMP
Power
supply        X124                              24 V supply
PROFIBUS DP
              X21         PROFIBUS cable         PROFIBUS DP
                                                node

              X242)       PROFIBUS cable         PROFIBUS DP
                                                node

Encoder       X23                               Incremental/
interface                                       absolute encoder

Power Module                                    SINAMICS
Interface PM-IF                                 PM340
                                                G_PM10_EN_00215
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1) SIMOTION D410-2 DP/PN only.

2) SIMOTION D410-2 DP only.

SIMOTION D410-2 connection overview

When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ and encoder cables used for the SINAMICS S120 CU310-2 Control Unit can also be used for SIMOTION D410-2.

For more information about signal cables, refer to the Industry Mall or Catalog PM 21, chapter MOTION-CONNECT connection systems.

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SIMOTION D410-2 Control Units

Technical specifications

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION
Product-type designation		D410-2 DP	D410-2 DP/PN
Version of the motion control system		Single-axis system with multi-axis option	Single-axis system with multi-axis option
PLC and motion control performance			
Maximum number of axes		8	8
Minimum PROFIBUS cycle clock	ms	1	1
Minimum PROFINET send cycle clock	ms	–	0.25
Minimum servo cycle clock	ms	0.5	0.5
Minimum interpolator cycle clock	ms	0.5	0.5
Servo/IPO clock cycle, remark		1 ms when using the TO axis and the integrated closed-loop drive control	1 ms when using the TO axis and the integrated closed-loop drive control
Integrated drive control			
Maximum number of axes for integrated drive control			
• servo		1	1
• vector		1	1
• V/f		1	1
• remark		Alternative control modes; drive control based on SINAMICS S120 CU310-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU310-2, firmware version V4.x
Memory			
RAM (work memory)	MB	48	48
Additional RAM work memory for Java applications	MB	20	20
RAM disk (load memory)	MB	31	31
Retentive memory	KB	108	108
Persistent memory (user data on CF)	MB	300	300
Communication			
DRIVE-CLiQ interfaces		1	1
Industrial Ethernet interfaces		1	1
PROFIBUS interfaces		2	1
• remark		Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave
PROFINET interfaces		0	1
• remark		–	Interface with 2 ports; supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device
General technical data			
Fan		Integrated	Integrated
DC supply voltage			
• rated value	V	24	24
• permissible range	V	20.4 … 28.8	20.4 … 28.8
Current consumption, typ.	mA	800	800
• remark		without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface
Making current, typ.	A	3	3
Power loss, typ.	W	20	20
Ambient temperature			
• during long-term storage	°C (°F)	-25 … +55 (-13 ... +131)	-25 … +55 (-13 ... +131)
• during transport	°C (°F)	-40 … +70 (-40 ... +158)	-40 … +70 (-40 ... +158)
• during operating	°C (°F)	0 … +55 (+32 ... +131)	0 … +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).
Relative humidity without condensation during operating phase	%	5 … 95	5 … 95

Technical specifications (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION
Product-type designation		D410-2 DP	D410-2 DP/PN
General technical data (continued)			
Air pressure	hPa	620 … 1 060	620 … 1 060
Protection class IP		IP20	IP20
Height	mm (in)	186.8 (7.35)	190.7 (7.51)
Width	mm (in)	73 (2.87)	73 (2.87)
Depth	mm (in)	74.4 (2.93)	74.4 (2.93)
Weight, approx.	g (lb)	830 (1.83)	830 (1.83)
Digital inputs			
Number of digital inputs		11	11
• remark		Of which: 5 DI and 3 F-DI (= 6 DI)	Of which: 5 DI and 3 F-DI (= 6 DI)
DC input voltage			
• rated value	V	24	24
• for signal "1"	V	15 … 30	15 … 30
• for signal "0"	V	-3 … +5	-3 … +5
Electrical isolation		Yes	Yes
Current consumption for "1" signal level, typ.	mA	6	6
Input delay for			
• signal "0" → "1", typ.	µs	50	50
• signal "1" → "0", typ.	µs	150	150
Digital inputs/outputs			
Number of digital inputs/outputs		8	8
Parameterization possibility of the digital inputs/outputs		Can be parameterized as DI, as DO, as measuring input (max. 8), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 8), as output cam (max. 8)
If used as an input			
DC input voltage			
• rated value	V	24	24
• for signal "1"	V	15 … 30	15 … 30
• for signal "0"	V	-3 … +5	-3 … +5
Electrical isolation		No	No
Current consumption for "1" signal level, typ.	mA	5	5
Input delay for			
• signal "0" → "1", typ.	µs	5	5
• signal "1" → "0", typ.	µs	50	50
Measuring input, reproducibility	µs	5	5
• remark		Typical value	Typical value
Measuring input, resolution	µs	1	1
If used as an output			
Load voltage			
• rated value	V	24	24
• permissible range	V	20.4 … 28.8	20.4 … 28.8
Electrical isolation		No	No
Current carrying capacity for each output, max.	mA	500	500
Leakage current, max.	mA	2	2
Output delay for			
• signal "0" → "1", typ.	µs	150	150
• signal "0" → "1", max.	µs	400	400
• signal "1" → "0", typ.	µs	75	75
• signal "1" → "0", max.	µs	100	100
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut

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SIMOTION D410-2 Control Units

■ **Technical specifications** (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION
Product-type designation		D410-2 DP	D410-2 DP/PN
If used as an output (continued)			
Output cam, reproducibility	μs	125	125
• remark		Typical value	Typical value
Output cam, resolution	μs	125	125
• remark		Typical value	Typical value
Switching frequency of the outputs for			
• ohmic load, max.	Hz	100	100
• inductive load, max.	Hz	0.5	0.5
• lamp load, max.	Hz	10	10
Short-circuit protection		Yes	Yes
Digital outputs			
Number of digital outputs		1	1
Parameterization possibility of the digital outputs		Can be parameterized as F-DO or DO	Can be parameterized as F-DO or DO
Load voltage			
• rated value	V	24	24
• permissible range	V	20.4 … 28.8	20.4 … 28.8
Electrical isolation		Yes	Yes
Current carrying capacity for each output, max.	mA	500	500
Leakage current, max.	mA	2	2
Output delay for			
• signal "0" → "1", typ.	μs	150	150
• signal "0" → "1", max.	μs	400	400
• signal "1" → "0", typ.	μs	75	75
• signal "1" → "0", max. - remark	μs	100 Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	100 Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut
Short-circuit protection		Yes	Yes
Analog input			
Number of analog inputs		1	1
If used as an analog voltage input			
Input voltage	V	-10 … +10	-10 … +10
Resolution	bit	12	12
• remark		+ sign	+ sign
Input resistance (Ri)	kΩ	100	100
If used as an analog current input			
Input current	mA	-20 … +20	-20 … +20
Resolution	bit	11	11
• remark		+ sign	+ sign
Input resistance (Ri)	Ω	250	250
Onboard encoder interface			
Encoder interface		Optional incremental encoder TTL, incremental encoder HTL or absolute encoder SSI without incremental signals TTL/HTL	Optional incremental encoder TTL, incremental encoder HTL or absolute encoder SSI without incremental signals TTL/HTL
Encoder supply for			
• 24 V DC	A	0.35	0.35
• 5 V DC	A	0.35	0.35
Limiting frequency, max.	kHz	500	500
SSI baud rate	kBd	100 ... 1000	100 ... 1000
Resolution of absolute position SSI	bit	30	30

Technical specifications (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION
Product-type designation		D410-2 DP	D410-2 DP/PN
Onboard encoder interface (continued)			
Cable length for			
• TTL incremental encoder, max.	m (ft)	100 (328)	100 (328)
• HTL incremental encoder for			
- unipolar signals, max.	m (ft)	100 (328)	100 (328)
- bipolar signals, max.	m (ft)	300 (984)	300 (984)
- remark		TTL only bipolar signals; for bipolar signals, the signal lines must be twisted in pairs and shielded	TTL only bipolar signals; for bipolar signals, the signal lines must be twisted in pairs and shielded
• SSI absolute encoder, max.	m (ft)	100 (328)	100 (328)
Additional technical data			
Input for the temperature measurement		KTY84-130 or PTC	KTY84-130 or PTC
Backup of non-volatile data			
• Backup of retentive data		Unlimited buffer duration	Unlimited buffer duration
• Buffer time real-time clock		5 days min.	5 days min.
• remark		Data backup is maintenance-free	Data backup is maintenance-free
Approvals			
• USA		cULus	cULus
• Canada		cULus	cULus
• Australia		C-Tick	C-Tick

Selection and ordering data

Description	Order No.
SIMOTION D410-2 DP Control Unit (SIMOTION V4.3 SP1 HF2 or higher)	6AU1410-2AA00-0AA0
SIMOTION D410-2 DP/PN Control Unit (SIMOTION V4.3 SP1 HF3 or higher)	6AU1410-2AD00-0AA0
SIMOTION CompactFlash card (CF) 1 GB with the current SIMOTION Kernel and SINAMICS S120 drive software V4.x *Pre-installed license can be obtained using additional order codes* [1] Note: A separate CompactFlash card is available for the SIMOTION D4x5-2 Control Units. (6AU1400-2PA22-0AA0)	6AU1400-1PA22-0AA0
MultiAxes Package license for SIMOTION D410-2	
• As Z option	M41
• As single license	6AU1820-0AA41-0AB0

[1] Note about licenses for runtime software:
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.
See Ordering licenses for runtime software in the Industry Mall or Catalog PM 21.

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D410-2 Control Units

■ Accessories

Description	Order No.	Description	Order No.
Accessories for SIMOTION D410-2		**Accessories for PROFINET**	
Rear panel mounting plate For installing the SIMOTION D410-2 in a different location if you do not wish to connect it to the Power Module.	6AU1400-7AA05-0AA0	**RJ45 FastConnect connector for Industrial Ethernet/PROFINET** 180° cable outlet	
Accessories for PROFIBUS		• 1 pack = 1 unit	6GK1901-1BB10-2AA0
PROFIBUS RS485 bus connector with axial cable outlet (180°) Max. transmission rate 12 Mbit/s		• 1 pack = 10 units	6GK1901-1BB10-2AB0
		• 1 pack = 50 units	6GK1901-1BB10-2AE0
• Without PG socket, with terminal blocks	6GK1500-0EA02	**RJ45 FastConnect connector for Industrial Ethernet/PROFINET** 145° cable outlet	
• Without PG socket, with FastConnect insulation displacement method	6GK1500-0FC10	• 1 pack = 1 unit	6GK1901-1BB30-0AA0
PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals Max. transmission rate 12 Mbit/s		• 1 pack = 10 units	6GK1901-1BB30-0AB0
		• 1 pack = 50 units	6GK1901-1BB30-0AE0
• Without PG interface	6ES7972-0BA42-0XA0	**FastConnect cables for Industrial Ethernet/PROFINET**[1]	
• With PG interface	6ES7972-0BB42-0XA0	• IE FC Standard Cable GP 2x2	6XV1840-2AH10
PROFIBUS FastConnect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals Max. transmission rate 12 Mbit/s		• IE FC Flexible Cable GP 2x2	6XV1870-2B
		• IE FC Trailing Cable GP 2x2	6XV1870-2D
		• IE FC Trailing Cable 2x2	6XV1840-3AH10
• Without PG interface	6ES7972-0BA60-0XA0	• IE FC Marine Cable 2x2	6XV1840-4AH10
• With PG interface	6ES7972-0BB60-0XA0	**Stripping tool for Industrial Ethernet/PROFINET FastConnect cables**	
PROFIBUS RS485 bus connector with cable outlet (90°) and screw-type terminals Max. transmission rate 12 Mbit/s		• IE FC stripping tool	6GK1901-1GA00
		Other accessories	
• Without PG interface	6ES7972-0BA12-0XA0	**Dust-proof blanking plugs** (50 units) for sealing unused DRIVE-CLiQ, Ethernet and PROFINET ports	6SL3066-4CA00-0AA0
• With PG interface	6ES7972-0BB12-0XA0		
PROFIBUS FastConnect RS485 bus connector with cable outlet (90°) and insulation displacement terminals Max. transmission rate 12 Mbit/s			
• Without PG interface	6ES7972-0BA52-0XA0		
• With PG interface	6ES7972-0BB52-0XA0		

[1] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

■ **More information**

More information
- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in the Industry Mall or Catalog PM 21, chapter MOTION-CONNECT connection systems.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.
- about the ordering data for SINAMICS drive components such as Power Modules, DRIVE-CLiQ cables, etc. can be found in Catalog PM 21, chapter SINAMICS S120 drive system and the Industry Mall under Drive Technology/Converters/...

Integrated drive control

The drive control functions integrated in a SIMOTION D410-2 are based on the drive control of a SINAMICS S120 CU310-2 (firmware version V4.x), although there is a slight difference in functionality. For example, the SIMOTION D410-2 does not have a basic positioner function (EPos), as this is already covered by SIMOTION technology functions.

For more information, refer to the Industry Mall and Catalog PM 21, chapter System description – Dimensioning and the documentation for SIMOTION and SINAMICS.

Licensing notes

SIMOTION D410-2 has an integrated drive control for either a servo, a vector or a V/f axis and is therefore ideal for single-axis applications.

One real axis can be used without license on the Control Unit. Speed-controlled axes and virtual axes never require a license.

SIMOTION D410-2 can be extended with additional SINAMICS S110/S120 Control Units (e.g. CU305) and so can also be used for smaller multi-axis applications (e.g. with 2 – 3 axes). A license is required for any additional axes. Where a license is required for a POS axis, the POS single-axis license is the ideal solution. It is better to use the MultiAxes Package D410-2 in the case of GEAR/CAM or more than one POS license.

The axis license with the highest functionality is covered by the inclusive license (a real axis).

The functionality has the following granularity:
CAM > GEAR > POS.

Example:

Application with 2 real axes: 1 POS, 1 CAM.

Only a POS license needs to be purchased because the higher-order CAM license is already included.

Licenses are also required for runtime functions such as SIMOTION IT Virtual Machine. These can be pre-installed on the CompactFlash card (CF card) or ordered separately.

For more information, refer to section Ordering of licenses for runtime software in the Industry Mall or Catalog PM 21.

SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S110, S120 drive families including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to the Industry Mall or Catalog PM 21, chapter System description – Dimensioning.

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D4x5-2 Control Units

Overview

SIMOTION D4x5-2 are drive-based Control Units for multi-axis systems. The individual variants essentially differ in terms of their PLC and motion control performance, memory size and interfaces. The main distinguishing features are:

Distinguishing features [2]	SIMOTION D425-2 DP	SIMOTION D425-2 DP/PN	SIMOTION D435-2 DP	SIMOTION D435-2 DP/PN	SIMOTION D445-2 DP/PN	SIMOTION D455-2 DP/PN
Performance class	BASIC	BASIC	STANDARD	STANDARD	HIGH	ULTRA-HIGH
Maximum number of axes	16	16	32	32	64	128
Second runtime level SERVO$_{Fast}$ / IPO$_{Fast}$	–	–	–	•	•	•
DRIVE-CLiQ interfaces	4	4	6	6	6	6
Communication interfaces						
• PROFIBUS	2	2	2	2	2	2
• PROFINET	–	1 (3 ports) [1]	–	1 (3 ports) [1]	1 (3 ports) [1]	1 (3 ports) [1]
• Ethernet	3	2	3	2	2	2

• available
– not available

The SIMOTION D425-2, D435-2, D445-2 and D455-2 Control Units feature PLC and motion control performance (open-loop control and motion control) for up to 16, 32, 64 or 128 axes, as required.

The integrated drive control enables each D4x5-2 Control Unit to operate up to 6 servo, 6 vector or 12 V/f axes.

The integrated drive control is based on the drive control of a SINAMICS S120 CU320-2 Control Unit (firmware version V4.x) and supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and V/f control.

Extension of the drive computing performance

The motion control performance of a SIMOTION D4x5-2 can be utilized in full by expanding the computing performance at the drive in two different ways:

- SINAMICS S120 Control Units (e.g. CU320-2) can be connected together with further SINAMICS S120 drive modules via PROFIBUS or PROFINET.
- The SIMOTION CX32-2 Controller Extension can be connected via DRIVE-CLiQ, This module is extremely compact and can control up to 6 servo, 6 vector or 12 V/f axes.

[1] Optional second PROFINET interface via CBE30-2 (4 ports)

[2] For further details such as cycle times, memory configuration, etc., refer to technical specifications.

SIMOTION Motion Control System
SIMOTION D – Drive-based

Application

Field of application for the SIMOTION D4x5-2 Control Units are applications with a large number of coordinated axes and short cycle times.

Typical fields of application are:
- Compact multi-axis machines
- High-performance applications with short machine cycles
- Compact machines
  - Including the complete machine control in the drive
  - With extensive connection possibilities for communication, HMI and I/O
- Distributed drive concepts
  - Applications with a large number of axes
  - Synchronization of several SIMOTION D Control Units via distributed synchronous operation

Design

SIMOTION D425-2 DP (on left) and SIMOTION D435-2 DP/PN with CBE30-2 inserted (on right)

Interfaces

Display and diagnostics
- LEDs to display operating states and errors
- 3 measuring sockets
- Service switch and mode selector
- Diagnostics button

Onboard I/Os
- 12 digital inputs
- 16 digital inputs/outputs (max. 16 as high-speed measuring inputs, max. 8 as high-speed output cams)

Communication
- 6 × DRIVE-CLiQ (4 × DRIVE-CLiQ for D425-2)
- 2 x Industrial Ethernet (3 × Industrial Ethernet for D4x5-2 DP), of which one interface easily accessible on the module front
- 2 x PROFIBUS DP
- 1 x PROFINET IO
  (1 interface with 3 ports, with D4x5-2 DP/PN only)
- 2 x USB

Data backup
- 1 x slot for SIMOTION CompactFlash card

Additional interfaces
- Terminals for 24 V electronics power supply

Option modules

With the TB30 Terminal Board, the SIMOTION D4x5-2 Control Units can be extended with 4 digital inputs, 4 digital outputs, 2 analog inputs and 2 analog outputs. The TB30 Terminal Board is plugged into the option slot on the Control Unit.

Using the CBE30-2 Communication Board for PROFINET IO, it is possible to equip the SIMOTION D4x5-2 DP/PN Control Units with a second PROFINET interface with 4 ports.

Applications for a second PROFINET interface:
- 2 separate networks (e.g. one local and one higher-level network)
- Address space can be doubled to 2×4 KB
- Maximum number of connectable devices can be doubled to 2×64
- Separation into a high-speed and a slow bus system/execution system in order to make efficient use of the controller's capacity (applies only to SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN)
  - PROFINET onboard: $SERVO_{Fast}$ and IPO_{Fast}
  - PROFINET via CBE30-2: SERVO / IPO / IPO2

Note:

The CBE30-2 cannot be used in SIMOTION D4x5-2 DP Control Units. If the CBE30-2 is used without $SERVO_{Fast}$ and IPO_{Fast}, then both PROFINET interfaces are assigned to SERVO / IPO / IPO2.

Assembly/Installation

The SIMOTION D4x5-2 Control Units can be mounted in the control cabinet in one of three ways:
- Mounting with spacers
- Mounting without spacers (D425-2 and D435-2 only)
- Mounting without spacers (external cooling, D445-2 and D455-2 only)

With external air cooling, the cooling fins of the D445-2/D455-2 Control Unit are outside of the control cabinet. A seal (option) is required so that the Control Unit can be hermetically mounted in the rear cabinet panel.

The SIMOTION D4x5-2 Control Units are supplied with pre-assembled spacers. These can be removed if necessary.

Data storage/data backup

The SIMOTION D4x5-2 Control Units store the retentive process data permanently in a manner that requires no maintenance (refer to technical data for memory size).

The real-time clock is backed up for several days via a Super-Cap. The backup time can be extended via a battery in the double fan/battery module.

The double fan/battery module incl. battery is contained in the scope of supply of the SIMOTION D4x5-2.

The runtime software, user data and user programs are stored retentively on the CompactFlash card (CF). The retentive process data of the Control Unit can also be stored on this CompactFlash card via system command, e.g. if spare parts are required.

SIMOTION Motion Control System
SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

Design (continued)

Extended execution system (SERVO$_{Fast}$ / IPO$_{Fast}$)

The SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN Control Units have (in addition to SERVO, IPO and IPO2) an additional second runtime level (SERVO$_{Fast}$ and IPO$_{Fast}$).

The additional runtime level allows the distribution of electric and/or hydraulic axes with different dynamic responses on a slow and a fast bus system so that the performance of the controller can be used more efficiently.

It also enables a particularly fast I/O processing in conjunction with high-speed PROFINET I/O modules.

Thanks to the extended execution system, electrical positioning drives can be controlled with cycle times in the millisecond range requiring fewer resources and at the same time the pressure-controlled axes of an hydraulic press can be controlled with a high dynamic response and short cycle times.

| SERVO = 1 ms / IPO = 2 ms | SERVO$_{Fast}$ = 0.25 ms / IPO$_{Fast}$ = 0.25 ms |
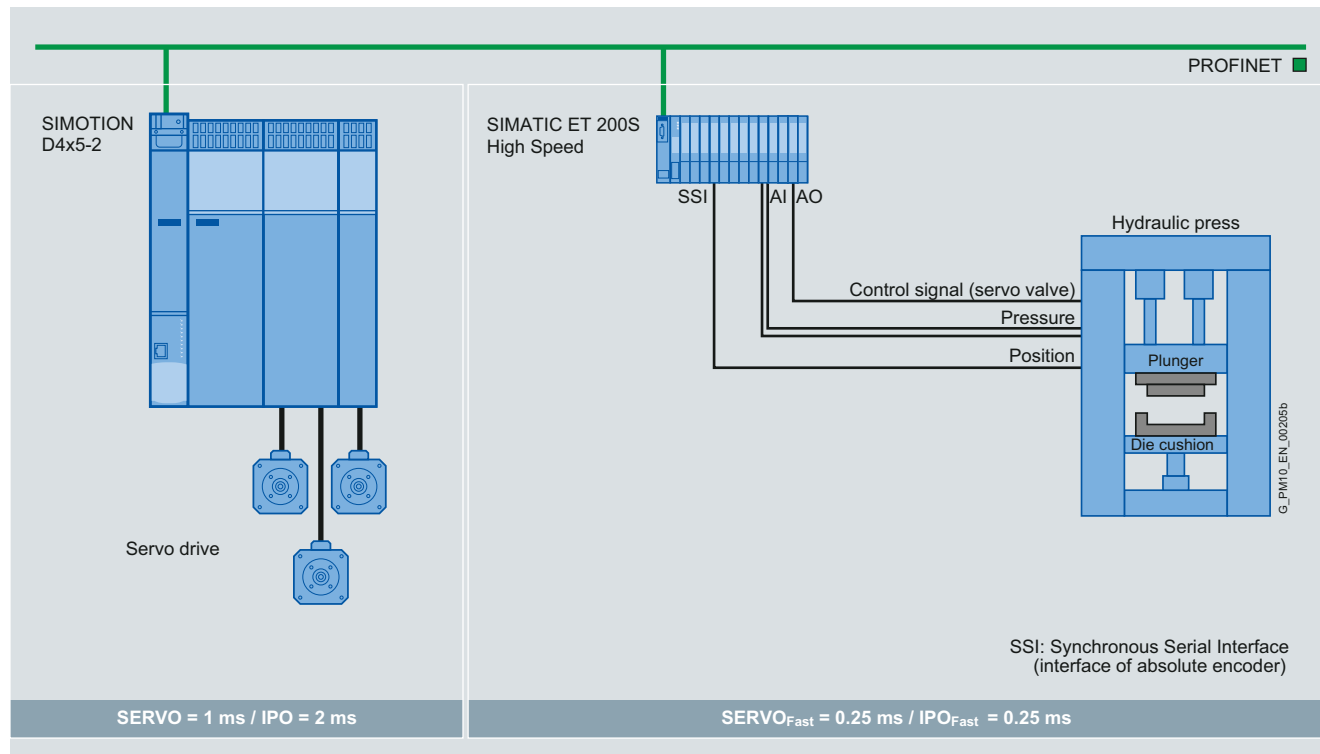
Closed-loop control of an hydraulic press with SERVO$_{Fast}$ and IPO$_{Fast}$

If SERVO$_{Fast}$ and IPO$_{Fast}$ are activated, the following assignment applies:

- SERVO$_{Fast}$ and IPO$_{Fast}$ are assigned to the PROFINET.
- SERVO, IPO and IPO2 are assigned to the PROFIBUS or the integrated drives of the SIMOTION D4x5-2/CX32-2.

If a second PROFINET interface is provided by means of a CBE30-2, this will also be assigned to SERVO, IPO and IPO2. In this case, the onboard PROFINET interface is always assigned to SERVO$_{Fast}$ und IPO$_{Fast}$.

Connectable I/Os

PROFINET IO:
- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/SP/M/eco PN/pro and TMC
- Drive systems (e.g. SINAMICS S110/S120)

PROFIBUS DP:
- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/Os
- Drive systems (e.g. SINAMICS S110/S120)

DRIVE-CLiQ:

Modules from the SINAMICS S120 range:
- TM15, TM17 High Feature Terminal Modules, TM31, etc.
- SMC/SME Sensor Modules
- DMC20/DME20 DRIVE-CLiQ Hub Module

USB:

The integrated USB interface allows, for example, a USB memory stick to be connected for a project or firmware update.

Expansion with SINAMICS S120 drive modules

SINAMICS S120 drive modules in booksize format (Line Modules, Motor Modules, etc.) are connected to the SIMOTION D4x5-2 Control Unit via DRIVE-CLiQ.

SINAMICS S120 PM340 Power Modules in blocksize format can be operated on the SIMOTION D4x5-2 Control Units with the CUA31/CUA32 Control Unit Adapters.
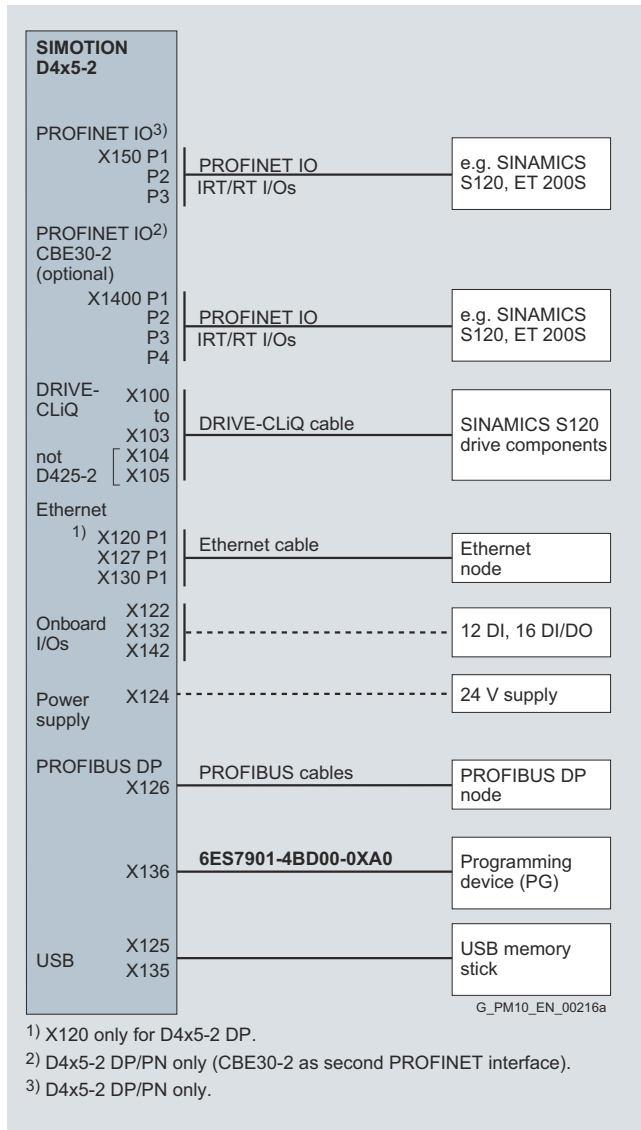
Note:

DRIVE-CLiQ cables which are required to connect Line/Motor Modules to SIMOTION D are supplied in a standard length with the Line/Motor Modules.

■ Integration

SIMOTION D4x5-2 Control Unit connection overview

[1] X120 only for D4x5-2 DP.

[2] D4x5-2 DP/PN only (CBE30-2 as second PROFINET interface).

[3] D4x5-2 DP/PN only.

When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ cables used for the SINAMICS S120 CU320-2 Control Unit can also be used for SIMOTION D4x5-2 Control Units.

For more information about signal cables, refer to the Industry Mall or Catalog PM 21, chapter MOTION-CONNECT connection systems.

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D4x5-2 Control Units

Technical specifications

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
Product-type designation		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
Performance class for motion control system		BASIC Performance	BASIC Performance	STANDARD Performance	STANDARD Performance	HIGH Performance	ULTRA-HIGH Performance
Version of the motion control system		Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system
PLC and motion control performance							
Maximum number of axes		16	16	32	32	64	128
Minimum PROFIBUS cycle clock	ms	1	1	1	1	1	1
Minimum PROFINET send cycle clock	ms	–	0.25	–	0.25	0.25	0.25
Minimum servo cycle clock	ms	0.5	0.5	0.5	0.25	0.25	0.25
Minimum interpolator cycle clock	ms	0.5	0.5	0.5	0.25	0.25	0.25
Servo / IPO clock cycle, remark		–	–	–	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO$_{FAST}$ and IPO$_{FAST}$	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO$_{FAST}$ and IPO$_{FAST}$	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO$_{FAST}$ and IPO$_{FAST}$
Integrated drive control							
Maximum number of axes for integrated drive control							
• servo		6	6	6	6	6	6
• vector		6	6	6	6	6	6
• V/f		12	12	12	12	12	12
• remark		Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x
Memory							
RAM (work memory)	MB	48	48	64	64	128	256
Additional RAM work memory for Java applications	MB	20	20	20	20	20	20
RAM disk (load memory)	MB	31	31	41	41	56	76
Retentive memory	KB	364	364	364	364	512	512
Persistent memory (user data on CF)	MB	300	300	300	300	300	300

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D4x5-2 Control Units

Technical specifications (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
Product-type designation		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
Communication							
DRIVE-CLiQ interfaces		4	4	6	6	6	6
USB interfaces		2	2	2	2	2	2
Industrial Ethernet interfaces		3	2	3	2	2	2
PROFIBUS interfaces		2	2	2	2	2	2
• remark		Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave
PROFINET interfaces		0	1	0	1	1	1
• remark		–	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	–	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)
General technical data							
Fan		Double fan/battery module included in scope of delivery	Double fan/battery module included in scope of delivery	Double fan/battery module included in scope of delivery	Double fan/battery module included in scope of delivery	Double fan/battery module included in scope of delivery	Double fan/battery module included in scope of delivery
DC supply voltage							
• rated value	V	24	24	24	24	24	24
• permissible range	V	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8
Current consumption, typ.	mA	700	1 000	700	1 000	1 900	1 900
• remark		Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface
Making current, typ.	A	5	5	5	5	5	5
Power loss, typ.	W	17	24	17	24	46	46
Ambient temperature							
• during long-term storage	°C (°F)	-25 … +55 (-13 ... +131)	-25 … +55 (-13 ... +131)	-25 … +55 (-13 ... +131)	-25 … +55 (-13 ... +131)	-25 … +55 (-13 ... +131)	-25 … +55 (-13 ... +131)
• during transport	°C (°F)	-40 … +70 (-40 ... +158)	-40 … +70 (-40 ... +158)	-40 … +70 (-40 ... +158)	-40 … +70 (-40 ... +158)	-40 … +70 (-40 ... +158)	-40 … +70 (-40 ... +158)
• during operating	°C (°F)	0 … +55 (+32 ... +131)	0 … +55 (+32 ... +131)	0 … +55 (+32 ... +131)	0 … +55 (+32 ... +131)	0 … +55 (+32 ... +131)	0 … +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D4x5-2 Control Units

■ **Technical specifications** (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
Product-type designation		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
General technical data (continued)							
Relative humidity without condensation during operating phase	%	5 … 95	5 … 95	5 … 95	5 … 95	5 … 95	5 … 95
Air pressure	hPa	620 … 1 060	620 … 1 060	620 … 1 060	620 … 1 060	620 … 1 060	620 … 1 060
Protection class IP		IP20	IP20	IP20	IP20	IP20	IP20
Height	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
Width	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)
Depth	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
• remark		When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep
Net weight	g (lb)	3600 (7.94)	3600 (7.94)	3600 (7.94)	3600 (7.94)	4400 (9.70)	4400 (9.70)
Digital inputs							
Number of digital inputs		12	12	12	12	12	12
DC input voltage							
• rated value	V	24	24	24	24	24	24
• for signal "1"	V	15 … 30	15 … 30	15 … 30	15 … 30	15 … 30	15 … 30
• for signal "0"	V	-3 … +5	-3 … +5	-3 … +5	-3 … +5	-3 … +5	-3 … +5
Electrical isolation		Yes	Yes	Yes	Yes	Yes	Yes
• remark		In groups of 6	In groups of 6	In groups of 6	In groups of 6	In groups of 6	In groups of 6
Current consumption for "1" signal level, typ.	mA	9	9	9	9	9	9
Input delay for							
• signal "0" → "1", typ.	µs	50	50	50	50	50	50
• signal "1" → "0", typ.	µs	150	150	150	150	150	150
Digital inputs/outputs							
Number of digital inputs/outputs		16	16	16	16	16	16
Parameterization possibility of the digital inputs/outputs		Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)
If used as an input							
DC input voltage							
• rated value	V	24	24	24	24	24	24
• for signal "1"	V	15 … 30	15 … 30	15 … 30	15 … 30	15 … 30	15 … 30
• for signal "0"	V	-3 … +5	-3 … +5	-3 … +5	-3 … +5	-3 … +5	-3 … +5
Electrical isolation		No	No	No	No	No	No
Current consumption for "1" signal level, typ.	mA	9	9	9	9	9	9
Input delay for							
• signal "0" → "1", typ.	µs	5	5	5	5	5	5
• signal "1" → "0", typ.	µs	50	50	50	50	50	50

■ **Technical specifications** (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
Product-type designation		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
If used as an input (continued)							
Measuring input, reproducibility	µs	5	5	5	5	5	5
Measuring input, resolution	µs	1	1	1	1	1	1
If used as an output							
Load voltage							
• rated value	V	24	24	24	24	24	24
• permissible range	V	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8	20.4 … 28.8
Electrical isolation		No	No	No	No	No	No
Current carrying capacity for each output, max.	mA	500	500	500	500	500	500
Leakage current, max.	mA	2	2	2	2	2	2
Output delay for							
• signal "0" → "1", typ.	µs	150	150	150	150	150	150
• signal "0" → "1", max.	µs	400	400	400	400	400	400
• signal "1" → "0", typ.	µs	75	75	75	75	75	75
• signal "1" → "0", max.	µs	150	150	150	150	150	150
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut
Output cam, reproducibility	µs	10	10	10	10	10	10
Output cam, resolution	µs	1	1	1	1	1	1
Switching frequency of the outputs for							
• ohmic load, max.	Hz	100	100	100	100	100	100
• inductive load, max.	Hz	2	2	2	2	2	2
• lamp load, max.	Hz	11	11	11	11	11	11
Short-circuit protection		Yes	Yes	Yes	Yes	Yes	Yes

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D4x5-2 Control Units

Technical specifications (continued)

Order No.	6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
Product brand name	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
Product-type designation	D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
Additional technical data						
Backup of non-volatile data						
• Backup of retentive data	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration
• Buffer time real-time clock	4 days min.	4 days min.	4 days min.	4 days min.	4 days min.	4 days min.
• remark	Longer buffer duration of the real time clock using a battery which is inserted in double fan/battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/battery module
Approvals						
• USA	cULus	cULus	cULus	cULus	cULus	cULus
• Canada	cULus	cULus	cULus	cULus	cULus	cULus
• Australia	C-Tick	C-Tick	C-Tick	C-Tick	C-Tick	C-Tick

Selection and ordering data

Description	Order No.
SIMOTION D425-2 DP Control Unit incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	**6AU1425-2AA00-0AA0**
SIMOTION D425-2 DP/PN Control Unit incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	**6AU1425-2AD00-0AA0**
SIMOTION D435-2 DP Control Unit incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	**6AU1435-2AA00-0AA0**
SIMOTION D435-2 DP/PN Control Unit incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	**6AU1435-2AD00-0AA0**
SIMOTION D445-2 DP/PN Control Unit incl. double fan/battery module and battery (SIMOTION V4.2 SP1 or higher)	**6AU1445-2AD00-0AA0**
SIMOTION D455-2 DP/PN Control Unit incl. double fan/battery module and battery (SIMOTION V4.2 SP1 or higher)	**6AU1455-2AD00-0AA0**
CompactFlash card (CF) 1 GB for SIMOTION D4x5-2 with the current SIMOTION Kernel and SINAMICS S120 drive software V4.x *Pre-installed license can be obtained using additional order codes* [1] Note: A separate CompactFlash card is available for the SIMOTION D410-2 Control Units (6AU1400-1PA22-0AA0).	**6AU1400-2PA22-0AA0**
MultiAxes Package license for SIMOTION D425-x	
• As Z option	**M42**
• As Z option incl. Safety Extended Functions	**S42**
• As single license	**6AU1820-0AA42-0AB0**
• As single license incl. Safety Extended Functions	**6AU1820-0AS42-0AB0**
MultiAxes Package license for SIMOTION D435-x	
• As Z option	**M43**
• As Z option incl. Safety Extended Functions	**S43**
• As single license	**6AU1820-0AA43-0AB0**
• As single license incl. Safety Extended Functions	**6AU1820-0AS43-0AB0**

Description	Order No.
MultiAxes Package license for SIMOTION D445-x/D455-x	
• As Z option	**M44**
• As Z option incl. Safety Extended Functions	**S44**
• As single license	**6AU1820-0AA44-0AB0**
• As single license incl. Safety Extended Functions	**6AU1820-0AS44-0AB0**

Note:

MultiAxes bundles are no longer available for the SIMOTION D4x5-2 (packages comprising Control Unit, CompactFlash card + MultiAxes Package license).

You can instead order the Control Unit and CompactFlash card with MultiAxes Package license individually:

Example for SIMOTION D445-2 DP/PN:
- Control Unit: 6AU1445-2AD00-0AA0
- CompactFlash card with MultiAxes Package license: 6AU1400-2PA22-0AA0 -Z M44

MultiAxes Packages

The MultiAxes Packages support particularly simple licensing. They contain the license for unlimited use of the POS/GEAR/CAM technology functions on the SIMOTION D Control Unit.

MultiAxes and Safety Packages

In addition to unlimited use of the axes licenses, the MultiAxes and Safety Packages also contain the licenses of the Safety Integrated Extended functions for all integrated SINAMICS drives (SIMOTION D and Controller Extensions CX32-2).

[1] Note about licenses for runtime software: Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately. See Ordering of licenses for runtime software in the Industry Mall or Catalog PM 21.

SIMOTION Motion Control System
SIMOTION D – Drive-based

SIMOTION D4x5-2 Control Units

◼ Accessories

Description	Order No.
Accessories for SIMOTION D4x5-2	
Double fan/battery module incl. battery Spare part for SIMOTION D4x5-2	**6FC5348-0AA02-0AA0**
Battery Spare part for fan/battery module	**6FC5247-0AA18-0AA0**
Seal for external air cooling (1 pack = 10 units) With external air cooling, the cooling fins of the Control Unit are outside of the control cabinet. A seal is required so that the D445-2/D455-2 can be hermetically mounted in the rear cabinet panel.	**6FC5348-0AA07-0AA0**
Accessories for PROFIBUS	
PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7972-0BA42-0XA0**
• With PG interface	**6ES7972-0BB42-0XA0**
PROFIBUS Fast Connect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7972-0BA60-0XA0**
• With PG interface	**6ES7972-0BB60-0XA0**
PROFIBUS adapter plug for raising the PROFIBUS connector to create more wiring space	**6FX2003-0BB00**
Accessories for PROFINET (interface X150)	
RJ45 FastConnect connector for Industrial Ethernet/PROFINET 145° cable outlet (10/100 Mbit/s)	
• 1 pack = 1 unit	**6GK1901-1BB30-0AA0**
• 1 pack = 10 units	**6GK1901-1BB30-0AB0**
• 1 pack = 50 units	**6GK1901-1BB30-0AE0**
FastConnect cables for Industrial Ethernet/PROFINET [1]	
• IE FC standard cable GP 2x2	**6XV1840-2AH10**
• IE FC flexible cable GP 2x2	**6XV1870-2B**
• IE FC trailing cable GP 2x2	**6XV1870-2D**
• IE FC trailing cable 2x2	**6XV1840-3AH10**
• IE FC marine cable 2x2	**6XV1840-4AH10**
Stripping tool for Industrial Ethernet/PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**

Description	Order No.
Accessory for Industrial Ethernet (interface X120, X127, X130)	
RJ45 FastConnect connector for Industrial Ethernet/PROFINET 180° cable outlet (10/100/1000 Mbit/s)	
• 1 pack = 1 unit	**6GK1901-1BB11-2AA0**
• 1 pack = 10 units	**6GK1901-1BB11-2AB0**
• 1 pack = 50 units	**6GK1901-1BB11-2AE0**
FastConnect cables for Industrial Ethernet/PROFINET [1]	
• IE FC Standard Cable GP 4x2	**6XV1878-2A**
• IE FC Flexible Cable GP 4x2	**6XV1878-2B**
Stripping tool for Industrial Ethernet/ PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**
Other accessories	
Dust-proof blanking plugs (50 units) for sealing unused DRIVE-CLiQ, Ethernet and PROFINET ports	**6SL3066-4CA00-0AA0**

◼ More information

More information
- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in the Industry Mall or Catalog PM 21, chapter MOTION-CONNECT connection systems.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication as well as Catalog PM 21, chapter Communication.
- about the ordering data for other SINAMICS drive components such as Line Modules, Motor Modules, DRIVE-CLiQ cables, etc. can be found in the Industry Mall or Catalog PM 21, chapter SINAMICS S120 drive system and the Industry Mall under Drive Technology/Converters/...

Integrated drive control

The drive control integrated in the SIMOTION D4x5-2 Control Units is based on the drive control of a SINAMICS S120 CU320-2 Control Unit (firmware version V4.x), whereby there are minor functional differences. For example, the integrated drive control does not have a basic positioner function (EPos), since this is already covered by SIMOTION technology functions.

For more information, refer to the Industry Mall or Catalog PM 21, chapter System description – Dimensioning and the documentation for SIMOTION and SINAMICS.

SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S110/S120 drive families including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to the Industry Mall or Catalog PM 21, chapter System description – Dimensioning.

[1] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

More information (continued)

Connectors and cables

The adapter plug (Order No. 6FX2003-0BB00) is required for D4x5-2 when the bus cable has to be looped through the left-hand PROFIBUS interface (X126; 2 PROFIBUS cables wired to the plug) and also

- Ethernet interface X120, in the case of D4x5-2 DP or
- Port 3 of the PROFINET interface X150 in the case of D4x5-2 DP/PN

has to be wired to a FastConnect plug. With the adapter plug fitted, the PROFIBUS connector is higher which creates extra wiring space.

Ethernet interfaces X120, X127 and X130 support 10, 100 and 1000 Mbit/s. For 1000 Mbit/s, 8-core cables (4x2) must be used as well as the 1000 Mbit version of the 180° FastConnect plug.

The 145° FastConnect plugs cannot be used for Ethernet interface X130 (cable outlet downwards). They also only support a maximum of 100 Mbit/s.

SIMOTION Motion Control System
SIMOTION D – Drive-based

■ Overview

The SIMOTION CX32-2 Controller Extension is a module in SINAMICS S120 booksize format. It enables the extension of the drive-side computing performance of the SIMOTION D4x5-2 Control Units.

The integrated drive computing performance enables the SIMOTION D4x5-2 Control Units to operate up to 6 servo, 6 vector or 12 *V/f* axes.
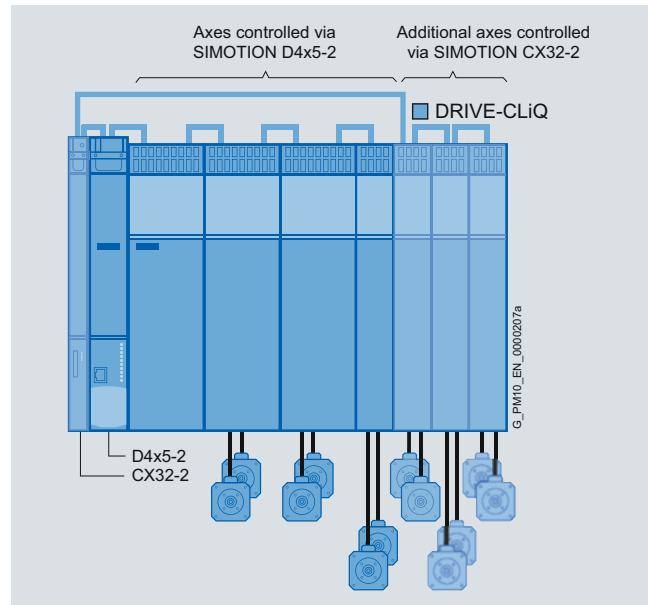
The SIMOTION CX32-2 Controller Extension extends the drive computing performance by up to 6 additional servo, 6 vector or 12 *V/f* axes. This allows the number of axes of a multi-axis system to be increased according to the requirements of the application.

If required, several CX32-2 Controller Extensions can be operated on one SIMOTION D4x5-2 Control Unit.

■ Benefits

- With a width of 25 mm (0.98 in), the CX32-2 Controller Extension requires very little space and is therefore well-suited for use in compact machines.
- The CX32-2 Controller Extension is connected to the SIMOTION D4x5-2 via DRIVE-CLiQ, so high-performance, isochronous closed-loop control of the drives is possible without the need for additional modules. The communication interfaces on the SIMOTION D4x5-2 remain available for other connections.
- The addressing of the Controller Extension is independent of the addressing on PROFIBUS/PROFINET. This is advantageous for modular machine concepts.
- Simple cabling and configuration
- The "Control operation" signal from an infeed connected to the SIMOTION D4x5-2 is particularly easy to interconnect to the drives of the CX32-2 Controller Extension.
- The CX32-2 Controller Extension does not require its own CompactFlash card. Data is managed centrally on the CompactFlash card of the SIMOTION D4x5-2 Control Unit. This has the following advantages:
  - Simple module replacement (no operator action required on the CX32-2, such as memory card replacement)
  - During firmware upgrades, the CX32-2 Controller Extension is automatically upgraded with the integrated drive of the SIMOTION D4x5-2 Control Unit
  - Central license handling via the SIMOTION D4x5-2

■ Design

Example: Axis grouping for 12 axes with SIMOTION D4x5-2 and SIMOTION CX32-2 Controller Extension

The SIMOTION CX32-2 Controller Extension is connected to the SIMOTION D4x5-2 via DRIVE-CLiQ.

In this way, a very compact axis grouping can be implemented, for example, with 12 servo axes.

If required, several SIMOTION CX32-2 Controller Extensions can be operated on one SIMOTION D4x5-2 Control Unit.

- Max. 3 CX32-2 units on one SIMOTION D425-2
- Max. 5 CX32-2 units on one SIMOTION D435-2, D445-2 or D455-2

In principle, a 4th or 6th CX32-2 Controller Extension can also be connected. In this case, no drives / drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the connected Controller Extensions. This can be useful, for example, when implementing distributed, modular machine concepts .

Additional drive controls can be implemented with SINAMICS S110/S120 Control Units via PROFIBUS or PROFINET.

Note

The SIMOTION CX32-2 Controller Extension can only be used with SIMOTION D4x5-2 Control Units. Operation with SIMOTION D4x5 Control Units is not possible.

The SIMOTION CX32 Controller Extension should be used for the SIMOTION D435 and D445-1 Control Units (Order No. 6SL3040-0NA00-0AA0).

Technical specifications

Order No.		6AU1432-2AA00-0AA0
Product brand name		SIMOTION
Product-type designation		CX32-2
Version of the motion control system		Controller Extension
Integrated drive control		
Maximum number of axes for integrated drive control		
• servo		6
• vector		6
• V/f		12
• remark		Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x
Communication		
DRIVE-CLiQ interfaces		4
General technical data		
Fan		No fan
DC supply voltage		
• rated value	V	24
• permissible range	V	20.4 … 28.8
Current consumption, typ.	mA	300
• remark		Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ interface
Making current, typ.	A	1.6
Power loss, typ.	W	7
Ambient temperature		
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 (6562 ft), the maximum ambient temperature decreases by 7° C (44.6 °F) per 1000 m (3281 ft).
Relative humidity without condensation during operating phase	%	5 … 95
Air pressure	hPa	620 … 1 060
Protection class IP		IP20
Height	mm (in)	380 (14.96)
Width	mm (in)	25 (0.98)
Depth	mm (in)	270 (10.63)
• remark		When the spacer is removed 230 mm (9.05 in) deep
Net weight	g (lb)	2600 (5.73)
Digital inputs		
Number of digital inputs		6
DC input voltage		
• rated value	V	24
• for signal "1"	V	15 … 30
• for signal "0"	V	-3 … +5

Order No.		6AU1432-2AA00-0AA0
Product brand name		SIMOTION
Product-type designation		CX32-2
Digital inputs (continued)		
Electrical isolation		Yes
• remark		in groups of 6
Current consumption for "1" signal level, typ.	mA	9
Input delay for		
• signal "0" → "1", typ.	µs	50
• signal "1" → "0", typ.	µs	150
Digital inputs/outputs		
Number of digital inputs/outputs		4
Parameterization possibility of the digital inputs/outputs		Parameterizable as DI, as DO, as measuring input (max. 4)
If used as an input		
DC input voltage		
• rated value	V	24
• for signal "1"	V	15 … 30
• for signal "0"	V	-3 … +5
Electrical isolation		No
Current consumption for "1" signal level, typ.	mA	9
Input delay for		
• signal "0" → "1", typ.	µs	5
• signal "1" → "0", typ.	µs	50
Measuring input, reproducibility	µs	5
Measuring input, resolution	µs	1
If used as an output		
Load voltage		
• rated value	V	24
• permissible range	V	20.4 … 28.8
Electrical isolation		No
Current carrying capacity for each output, max.	mA	500
Leakage current, max.	mA	2
Output delay for		
• signal "0" → "1", typ.	µs	150
• signal "0" → "1", max.	µs	400
• signal "1" → "0", typ.	µs	75
• signal "1" → "0", max.	µs	100
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut

SIMOTION Motion Control System
SIMOTION D – Drive-based

Supplementary components
SIMOTION CX32-2 Controller Extension

Technical specifications (continued)

Order No.	**6AU1432-2AA00-0AA0**	
Product brand name	SIMOTION	
Product-type designation	CX32-2	
If used as an output (continued)		
Switching frequency of the outputs for		
• ohmic load, max.	Hz	100
• inductive load, max.	Hz	2
• lamp load, max.	Hz	11
Short-circuit protection		Yes
Additional technical data		
Backup of non-volatile data		
• Backup of retentive data		Unlimited buffer duration
Approvals		
• USA		cULus
• Canada		cULus
• Australia		C-Tick

Selection and ordering data

Description	Order No.
SIMOTION CX32-2 Controller Extension for SIMOTION D4x5-2	**6AU1432-2AA00-0AA0**

SIMOTION Motion Control System
SIMOTION D – Drive-based

Overview

The CBE30-2 Communication Board can be used to provide the SIMOTION D4x5-2 DP/PN with a second PROFINET interface.

Application

Applications for a second PROFINET interface are as follows:

- 2 separate networks (e.g. one local and one higher-level network)
- Address space can be doubled to 2 × 4 KB
- Maximum number of connectable devices can be doubled to 2 × 64
- Separation into a high-speed and a slow bus system/ execution system in order to make efficient use of the controller's capacity (applies only to SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN)

Function

The CBE30-2 Communication Board provides the following functions:

- PROFINET IO controller, I-Device (also controller and device simultaneously)
- 100 Mbit/s full-duplex/autocrossing
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with four RJ45 sockets. The optimum topology (line, star, tree) can therefore be configured without additional external switches.
- Support of media redundancy (MRP/MRPD).

Integration

The CBE30-2 Communication Board is plugged into the option slot on the SIMOTION D4x5-2 DP/PN.

Note

The CBE30-2 Communication Board can only be used with the SIMOTION D4x5-2 DP/PN Control Units.

It is not compatible with SIMOTION D425, D435, D445-1 and D4x5-2 DP.

Technical specifications

CBE30-2 Communication Board	
Current requirement at 24 V DC	0.25 A
Permissible ambient temperature	
• Storage and transport	-40 … +70 °C (-40 ... +158 °F)
• Operation	0 … 55 °C (32 ... 131 °F)
Weight, approx.	100 g (0.22 lb)
Dimensions (W × H × D)	25 × 95 × 143 mm (0.98 × 3.74 × 5.63 in)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
CBE30-2 Communication Board For SIMOTION D4x5-2 DP/PN (SIMOTION V4.3 SP1 or higher)	**6FC5312-0FA00-2AA0**

Accessories

Description	Order No.
RJ45 FastConnect connector for Industrial Ethernet/PROFINET	
• 145° cable outlet (10/100 Mbit/s)	
- 1 pack = 1 unit	**6GK1901-1BB30-0AA0**
- 1 pack = 10 units	**6GK1901-1BB30-0AB0**
- 1 pack = 50 units	**6GK1901-1BB30-0AE0**
FastConnect cables for Industrial Ethernet/PROFINET [1]	
• IE FC Standard Cable GP 2x2	**6XV1840-2AH10**
• IE FC Flexible Cable GP 2x2	**6XV1870-2B**
• IE FC Trailing Cable GP 2x2	**6XV1870-2D**
• IE FC Trailing Cable 2x2	**6XV1840-3AH10**
• IE FC Marine Cable 2x2	**6XV1840-4AH10**
Stripping tool for Industrial Ethernet/PROFINET FastConnect cables	
• IE FC stripping tool	**6GK1901-1GA00**

More information

More information about FastConnect cables can be found in Catalog IK PI (Industrial Communication) and the Industry Mall under Automation Technology/Industrial Communication/ Industrial Ethernet/Cabling technology/...

[1] Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

SIMOTION Motion Control System
SIMOTION D – Drive-based

Supplementary components
TB30 Terminal Board

Overview

The TB30 Terminal Board supports the addition of digital inputs/digital outputs and analog inputs/analog outputs to the CU320-2 and SIMOTION D4x5/D4x5-2 Control Units.

Design

The following are located on the TB30 Terminal Board:
- Power supply for digital inputs/digital outputs
- 4 digital inputs
- 4 digital outputs
- 2 analog inputs
- 2 analog outputs

The TB30 Terminal Board plugs into the option slot on a Control Unit.

A shield connection for the signal cable shield is located on the Control Unit.

Technical specifications

TB30 Terminal Board 6SL3055-0AA00-2TA0	
Power requirement, max. At 24 V DC via Control Unit without taking account of digital outputs	0.05 A
• Conductor cross section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Digital inputs in accordance with IEC 61131-2 Type 1	
• Voltage	-3 … +30 V
• Low level (an open digital input is interpreted as „low")	-3 … +5 V
• High level	15 … 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs [1], approx.	
- L → H	50 μs
- H → L	100 μs
• Conductor cross-section, max.	0.5 mm^2
Digital outputs Sustained short-circuit strength	
• Voltage	DC 24 V
• Load current per digital ouput, max.	500 mA
• Delay time of digital outputs [1], approx.	150 μs
• Conductor cross-section, max.	0.5 mm^2
Analog inputs Difference	
• Voltage range (an open analog input is interpreted as 0 V)	-10 … +10 V
• Internal resistance R_i	65 kΩ
• Resolution [2]	13 bit + Vorzeichen
• Conductor cross-section, max.	0.5 mm^2
Analog outputs Sustained short-circuit strength	
• Voltage range	-10 … +10 V
• Load current, max.	-3 … +3 mA
• Resolution	11 bit + Vorzeichen
• Setting time, approx.	200 μs
• Conductor cross-section, max.	0.5 mm^2
Power loss	< 3 W
Weight, approx.	0.1 kg (0.2 lb)
Approvals, according to	cULus

Selection and ordering data

Description	Order No.
TB30 Terminal Board	**6SL3055-0AA00-2TA0**

[1] The specified delay times refer to the hardware. The actual reaction time depends on the time slot in which the digital input is processed.

[2] If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency $f_a = 1/t_{time\ slice}$ must be at least twice the value of the highest signal frequency f_{max}.

Integration
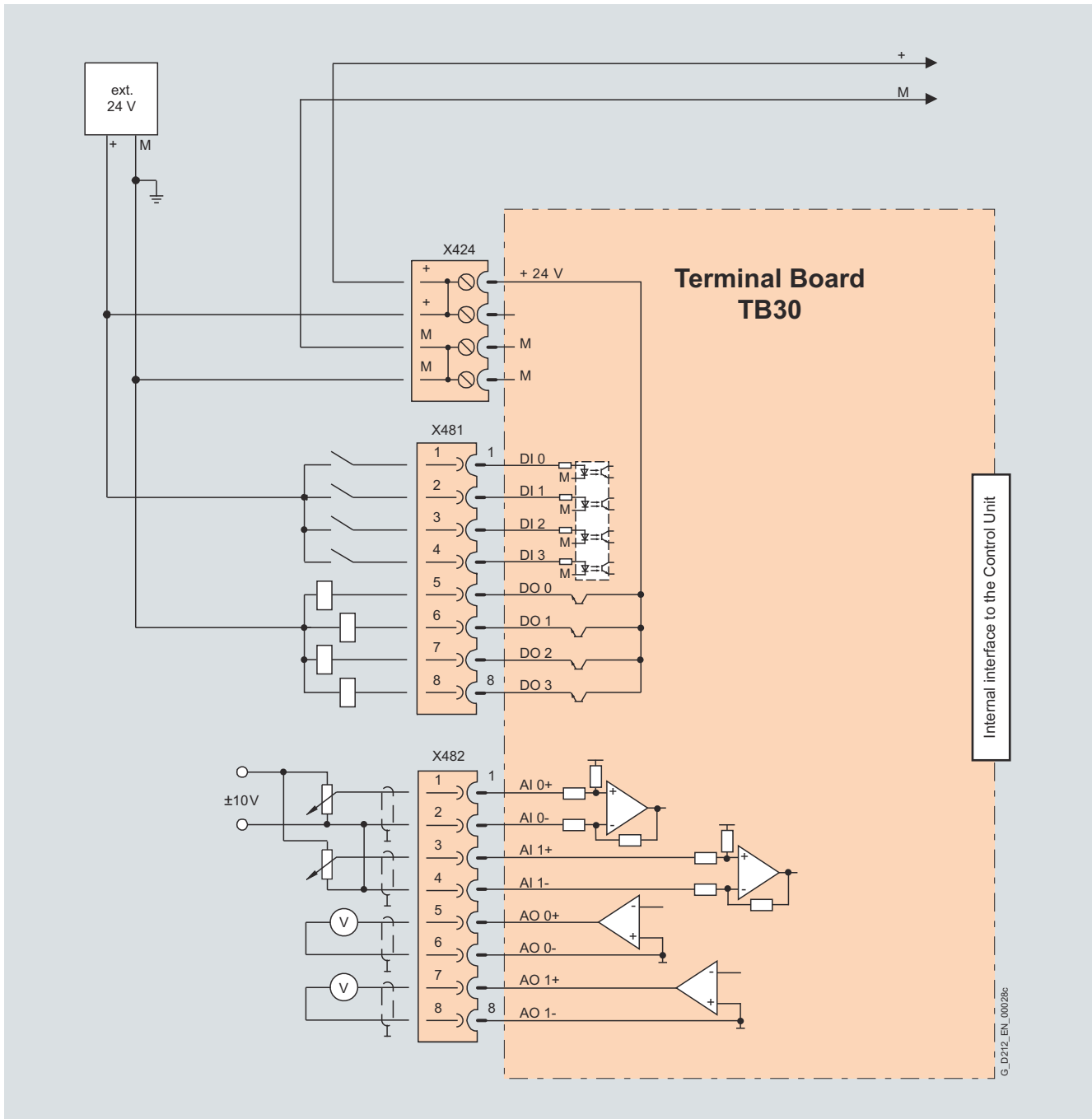
Connection example TB30 Terminal Board

Get more information

Motion Control System SIMOTION:
www.siemens.com/simotion

The drives family SINAMICS:
www.siemens.com/sinamics

Motion Control Systems and
Motion Control Solutions
for production machine and machine tool equipment:
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